The *Demand/Capacity* portion of this chapter analyzes Lunken Airport's existing and future operational airfield capacity. The Demand/Capacity Analysis was based on the airfield facilities described in Chapter 1.0 and the projected aviation demand levels described in Chapter 2.0.

The Facility Requirements portion of this chapter analyzes the capacities and conditions of the Airport's existing airfield and landside facilities compared to the aviation forecast demand levels. Facility requirements will be identified that permit the Airport to accommodate future demand at acceptable levels of delay. The facility requirement programs associated with the 1989 Lunken Master Plan and other recent Lunken Airport planning studies were utilized and updated.

To plan Lunken Airport's future facility needs, this chapter of the study takes the projections of aviation activity that were presented in Chapter 2.0, and translates the design year projections into specific types and quantities of facilities that would be needed to adequately serve the 5-, 10-, and 20-year activity levels.

This chapter is intended to identify, in general terms, the deficiencies or omissions of the existing facilities and outline what new facilities will be needed to meet the projected growth. In the following Chapter 4.0, alternatives for providing these facilities will then be identified and evaluated to determine the most efficient and cost-effective means of implementation.

The Lunken Airport aviation demand forecasts are a projection of future traffic, and are not a goal of the City of Cincinnati. The Implementation of airport improvement projects may occur when adequate growth in traffic is achieved and the City of Cincinnati elects to pursue specific capital improvement projects.

The determination of Lunken Airport's long-range facility requirements is based on an analysis of the following five major study elements:

- Airfield Demand/Capacity Methodology
- Airfield Facility Requirements
- Landside Airport Facility Requirements
- Airport Support Facilities Requirements
- Facility Requirements Summary

3.1 Airfield Demand/Capacity Methodology

FAA planning guidance contained in *Airport Capacity and Delay Manual (FAA Advisory Circular 150/5060-5)* and industry practice in master planning require that demand and capacity be developed and analyzed separately to provide a realistic indication of what can be expected in the future at an airport.

Runway system demand is defined as a best estimate of projected activity levels, based upon relevant factors, including economic, socioeconomic, facility, and industry data. Demand is forecasted in 5-, 10-, and 20-year timeframes. The short-term forecasts, which have the highest probability of accuracy, are aligned with the 5-year outlook period for environmental analysis, which considers this period as the reasonably foreseeable timeframe. In planning studies, forecast demand is used to represent the best estimate of future activity levels. Forecast demand is also used within the industry to trigger or initiate the related development projects required to serve or accommodate the demand at acceptable levels of peak hour delay.

Runway system capacity is most often expressed in hourly, daily, or annual measures of throughput. Consistent with industry practice, the long-range planning for this Lunken Airport Master Plan Update uses the annual operating capacity or annual service volume (ASV) to measure the Airport's total throughput capability of the runway system to process existing and future

demand levels. These calculations are used to project future deficiencies of existing airfield facilities (runways, taxiways, and instrumentation) at the Airport.

The actual capacity of an airport is determined by a number of factors, including meteorology. airfield layout, runway use, aircraft fleet mix. instrumentation, percentage of operations that are arrivals and departures, touchand-go operations, and exit taxiway locations. The theoretical capacity, whether it is hourly, daily, or annual, is compared to the forecast demand levels to assess the need for additional airfield improvements. The actual capacity of a facility can be constrained or capped by landside access, aircraft parking, or airside facilities. Therefore, it is not acceptable practice to estimate or evaluate the actual capacity of an airport based solely on airfield capacity. Such is the case at Lunken Airport, which has a total land area of approximately 1,025 acres. This includes approximately 989 acres of fee simple property and approximately 36 acres of avigation easement. Also included in the 989 acres of airport property is approximately 190 acres of land used by the City of Cincinnati for a park, open space and a golf course. With the airfield system of three runways combined with the adjacent park area and the fully developed Wilmer Avenue and Airport Road hangar areas, the Airport has limited land available to accommodate the theoretical capacity of the existing runway system.

3.2 Airfield Facility Requirements

Airfield facility requirements were identified based on a comparison of the airfield's actual capacity with future potential aviation demand. The runway/taxiway configuration includes the physical layout of the airfield system, the number of runways, their orientations, and their locations relative to each other and to other landside facilities. Each runway/taxiway configuration has a different capacity due to operational limitations and restrictions. For example, runways that converge or intersect have lower capacities than parallel runways. This lower capacity occurs because aircraft on one runway must wait to land or

take off until the aircraft on the second runway has either completed its landing or is clear of the first runway on takeoff.

As shown previously on Exhibit 1-3, the Airport has three runways:

- Runway 3R-21L (6,101 feet x 150 feet)
- Runway 3L-21R (3,802 feet x 100 feet)
- Runway 7-25 (5,128 feet x 100 feet)

The requirements for runways and taxiways may be described in a number of terms. In this section, the factors that may cause operational limitations or restriction to runway system capacity are discussed individually:

- Runway Orientation
- Runway Capacity
- Review of 2001 Pavement Analysis
- Group III Design Aircraft
- Runway Strength
- Geometric Design Standards
- Taxiway Design Standards
- Taxiway Configuration
- Runway Instrumentation

3.2.1 Runway Orientation

The orientation of runways for takeoff and landing operations is primarily a function of wind velocity and direction, combined with the ability of aircraft to operate under various wind conditions. As a general rule, the primary runway at an airport is oriented as close as practical in the direction of the prevailing winds. The most desirable runway configuration provides the highest wind coverage for a given maximum crosswind component. Runway wind coverage is that percentage of time in which operations can safely occur because of acceptable crosswind components. The crosswind component is the vector of wind velocity and direction which

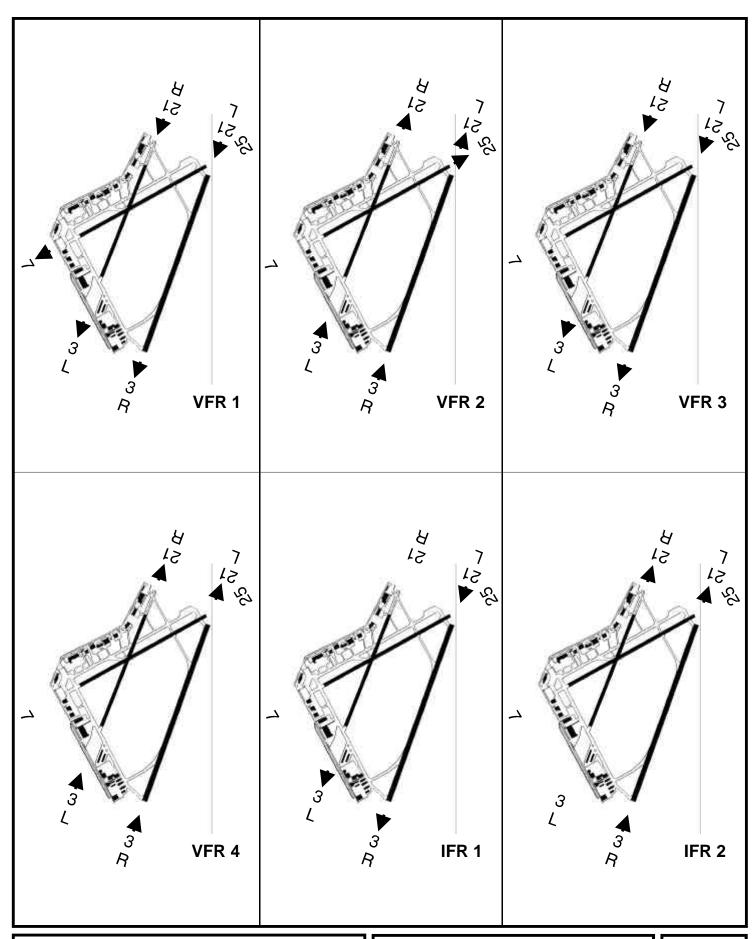
acts at a right angle to the runway. The desirable wind coverage for a runway system has been set by the FAA at a minimum of 95 percent with a 12-mph (10.5 knot) crosswind component.

The individual runways at Lunken Airport combine to provide approximately 98 percent all weather wind coverage, with a 12-mph crosswind component. Under visual flight rules (VFR) weather conditions which occur approximately 84 percent of the time (above 1-mile visibility and above a 1,000-foot ceiling); Lunken Airport has 97 percent cross-wind coverage with a 12-mph crosswind component. Under instrument flight rules (IFR) conditions (less than 1-mile visibility and less than 1,000-foot ceiling), which occur approximately 16 percent of the time; the Airport also has 97 percent cross-wind coverage.

3.2.2 Runway Capacity

Runways at Lunken Airport include: two parallel north-south runways (3R-21L, 3L-21R) and a single northeast-southwest crosswind runway (7-25). Operationally, the runways are used in different combinations (configurations) depending upon wind and weather conditions and upon the type of demand being accommodated (aircraft fleet mix). The 2,100-foot horizontal separation between the two parallel runways is sufficient to allow simultaneous, independent arrivals at the Airport during visual weather conditions.

The four most common VFR and two most common IFR operating configurations are shown in **Exhibit 3-1**. Discussions with Airport staff and air traffic control personnel, as well as an analysis of the historical runway system operations, were the basis for the assumptions used in the development of the airfield operational configurations. These assumptions include:





VFR AND IFR OPERATING CONDITIONS

EXHIBIT 3-1 First, these configurations do not include all possible combinations; rather they include configurations which are most frequently used. The configurations are representative of those used during high and peak demand periods, requiring the air traffic controller to queue aircraft and to operate well defined configurations. During periods when demand is well below peak levels, runway usage is often selected on the basis of convenience as determined by either the origination or destination of the aircraft. When peak demand periods occur or when weather conditions require, the air traffic controller shifts to the more defined configurations. Second, these configurations are separated into VFR and IFR categories as prescribed by the FAA. VFR rules are typically in effect when weather conditions are such that aircraft can maintain safe separation by visual means. IFR conditions occur when the visibility or ceiling falls below those minimums prescribed under VFR.

The distinction between IFR and VFR is important, because the separation distance required between aircraft operating in IFR conditions is greater than that required during VFR conditions. Consequently, fewer aircraft operations can occur in the same configuration during IFR conditions than during VFR conditions, which occur approximately 84 percent of the time.

As shown in **Table 3-1**, for purposes of the airfield capacity analyses the FAA has categorized the aircraft fleet mix into four aircraft classes.

	TABL Cincinnati Municipal A		1
	AIRCRAFT FLEE	•	
Aircraft Class	Maximum Certified Takeoff Weight (lbs)	Number of Engines	Wake Turbulence Classification
Α	12,500 lbs or Less	Single	Small (S)
В	12,500 lbs 01 Less	Multi	Sman (3)
С	12,500 - 300,000 lbs	Multi	Large (L)
D	Over 300,000	Multi	Heavy (H)

Source: FAA Advisory Circular 150/5060-5 "Airport Capacity and Delay."

Similar to the runway use configurations, aircraft fleet mix estimates must consider VFR and IFR conditions to adjust for the decrease in demand during IFR conditions. To develop peak hour fleet mix estimates for VFR and IFR, the following assumptions were made:

- All Class C aircraft were assumed to have instrument capability; therefore, IFR and VFR demands are the same for Class C aircraft, resulting in an increased fleet mix percentage during IFR conditions.
- The effect of weather on small general aviation aircraft traffic is assumed to vary for the different aircraft classifications. Seventyfive percent of Class A and 50 percent of Class B operations are expected to drop out during IFR conditions.

Table 3-2 shows the resulting VFR and IFR fleet mix projections for the three planning periods.

				TABLE 3-2				
		Cincir	nati Munic	ipal Airpoi	t- Lunken l	Field		
		OPER/	ATIONAL F	LEET MIX	PERCENTA	AGES		
Aircraft				Υe	ear			
Class	(Base Y	ear) 2002	20	07	20	12	20	22
Class	VFR	IFR	VFR	IFR	VFR	IFR	VFR	IFR
А	55.4%	28.9%	55.1%	28.1%	51.4%	24.5%	46.0%	19.9%
В	20.8%	21.7%	19.3%	19.7%	17.9%	17.1%	15.8%	13.7%
С	23.8%	49.5%	25.6%	52.2%	30.7%	58.4%	38.3%	66.4%
D	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
TOTAL	100%	100%	100%	100%	100%	100%	100%	100%

Source: PB Aviation, 2003

Chapter 2.0 identified annual demand projections of aircraft operations in an unconstrained environment based upon historical Lunken Airport activity. From this information, capacity analyses were performed for the existing case as well as for each of the planning periods (2007, 2012, and 2022). Capacity constraints that were identified are addressed in a subsequent sensitivity analysis which identifies capacity-increasing alternatives for the airfield.

Lunken Airport's aircraft operational peaking characteristics, as described in Chapter 2.0, are summarized as follows:

	<u>Period</u>	Peaking Characteristics
•	Peak Month	10.3 percent of Annual Demand
•	Average Day	Peak Month/30.5 Days
•	Peak Hour	10.7 percent of Average Day

The resulting peak hour demands are as follows:

		<u>2002</u>	<u>2007</u>	2012	<u> 2022</u>
•	Total Peak Hour Operations	48	56	63	72

As shown in Chapter 2.0, the peak hour demand continues at an unconstrained rate in conjunction with the annual demand estimates. It is

assumed that should Lunken Airport reach a demand level which results in significant delay per aircraft operation, the peaking characteristics would change along with the annual demand for the facility. Further discussion of this relationship is included in later sections of this chapter.

PEAK HOUR AIRFIELD CAPACITY: The ultimate capacity for each of the predominant runway configurations (VFR and IFR) at Lunken Airport was computed using the most recent version of the FAA's Advisory Circular 150/5300-6 Airport Capacity and Delay. Input requirements for these calculations included runway configurations, instrumentation, and runway exit ratings. Additionally, unique fleet mix data were input for each phase of the planning period; however, a lack of significant change in the percentage of Class C aircraft resulted in identical hourly capacity results.

Assuming that the Airport operates in its greatest capacity configurations whenever possible, an analysis was performed to calculate the amount of time in which it was necessary to use lesser capacity configurations due to weather and wind requirements. These data, in conjunction with an hourly capacity and a percent maximum capacity weighting factor (defined by the FAA Advisory Circular), were used to calculate an existing airfield weighted hourly capacity (CW) capable of 81.5 operations per hour for the Airport.

ANNUAL SERVICE VOLUME: Annual capacity or Annual Service Volume (ASV) was calculated using the weighted hourly capacity and the peaking characteristics of the Airport. Assuming an unconstrained demand and the existing peaking characteristics, the ASV for Lunken Airport was calculated at 225,414 operations versus the total projected demand of 187,122 operations in 2022 (does not include 2,700 helicopter operations, see Table 2-3). The results of this analysis, as well as the capacity during adverse weather (Cw) for the Airport, are presented in **Table 3-3**.

	Cinc	innati Muni	TABLE 3-3 cipal Airpo		Field	
			CAPACITY			
	Capacity			Den	nand	
Period	Variable	Capacity	2002	2007	2012	2022
Hourly	C_{w}	81.5	48	56	63	72
Annual	ASV	225,414	129,546	147,476	161,719	187,122
Percent	of Annaul (Capacity	57.5%	65.4%	71.7%	83.0%

Source: PB Aviation, 2003

It is typically not desirable for an airport's operations to exceed 60 percent of its airfield capacity. When an airport's demand reaches 60 percent of its capacity, enhancements should be planned. When airport activity reaches 80 percent of the capacity, new runway system facilities should be constructed or demand management strategies should be in place. The 60 percent planning ratio and the 80 percent action ratio were applied to the estimated ASV for the Airport to determine a specific timeframe in which these milestones could be expected to be reached. The Airport's baseline annual demand is projected to increase from 129,546 operations (does not include 2,668 helicopter operations) (57.5 percent of ASV) in 2002 to 187,122 operations (83.0 percent of ASV) in 2022. This level of demand, when compared to the Airport's ASV, indicates that without airfield system capacity improvements, the planning of new airfield facilities for capacity enhancing measures should commence toward the end of the planning period.

As discussed in Chapter 1.0 for airfield safety considerations, runway system improvements such as a parallel taxiway and the additional exits for Runway 3R-21L will not only eliminate runway crossings; they will also allow aircraft to exit the runway system more quickly. The parallel taxiway and additional exits will increase the hourly capacity by 18.5 percent. This

^{*} Does not include helicopter operations

results in an improved ASV ratio of 64.5 percent (83.0%-18.5%). Therefore, if the parallel taxiway and additional exits for Runway 3R-21L are constructed, no new runway system capacity improvements will be needed during the 20-year planning period.

Other practical considerations that are used to determine the need for additional runway capacity projects include the acceptable delay per peak hour aircraft operation. For general aviation airports it is generally acceptable for delays of four to ten minutes for each peak hour operation. With the development of a parallel taxiway for Runway 3R/21L in combination with an acceptable practical delay of four to ten minutes per peak hour operation, indicates that no additional runways or other major airfield improvement projects will be required at Lunken Airport during the 20-year planning period.

3.2.3 Review of 2001 Pavement Analysis

The basis of the pavement capacity analysis for the Lunken Airport Master Plan Update is the September 21, 2001 report prepared by H.C. Nutting Company entitled, *Report of Pavement Evaluation 2001, City of Cincinnati Lunken Field, Runway 3R-21L, Taxiways and Aprons.* The primary focus of the pavement investigation was to determine the load carrying capacity and remaining useful life of Runway 3R-21L. The associated taxiways and various apron areas were also investigated but did not require the same level of detail as Runway 3R-21L.

The approach H.C. Nutting took to determine the existing pavement strength, as well as their methodology of calculating useful life remaining, closely follow FAA guidelines depicted within Advisory Circular 150/5320 – 6D, *Airfield Pavement Design and Evaluation*. As an added measure,

H.C. Nutting also included a "factor of safety" analysis which provided extremely conservative numbers as an end product.

Our review of the H. C. Nutting report concurs that the existing Runway 3R-21L pavements can sustain an average of 2,370 equivalent annual departures by an aircraft weighing 120,000 pounds (dual gear) through the next seven years is based on sound engineering principles. It is important to note that the existing pavements may have a useful service life well beyond the original 20-year design life, depending on actual air traffic activity, and the pavements are well maintained, well drained, and not structurally overstressed on a regular basis. It is also important to note that the relative aircraft size and weight alone are not the sole determining factors when considering pavement strength. An important consideration is the main gear configuration of the aircraft in question. Since the total aircraft weight is distributed through the footprint of the landing gear, a heavier aircraft equipped with dual-tandem gear could exert the same or even less stress to the pavement as that of a lighter aircraft with dual gear.

This also means that the infrequent use of the airfield by dual-tandem and even quad-tandem aircraft in excess of the 120,000 pound gross weight limit can be tolerated without concern regarding serious pavement damage. However, if the operation of a considerably larger aircraft exceeds 250 departures per year, the determination of the "critical aircraft" should be revisited and the impact on airfield pavements reassessed.

3.2.4 Group III Design Aircraft

The planning and design of an airport is typically based on the airport's role and the critical aircraft that use it. Guidance for the planning and design of the airfield will be based on FAA Advisory Circulars that aim to maximize airport safety, economy, efficiency, and longevity.

For geometric airfield design purposes, it is necessary to establish applicable design standards for future runway, taxiway, and apron development projects at Lunken Airport. Information from FAA Advisory Circular 150/5300-13, Airport Design, was used to determine the Airport Reference Code (ARC) for Lunken Airport. The ARC is a coding system used to relate airport design criteria to the operational and physical characteristics of the aircraft intended to operate at an airport. As shown on **Table 3-4**, the ARC has two components that reflect an airport's critical The first component, depicted by a letter, is the approach aircraft. category of the aircraft as defined by aircraft approach speed. second component, depicted by a Roman numeral, is the airplane design group, which is determined by aircraft wingspan. Generally, aircraft approach speed applies to runways and runway-related facilities. Aircraft wingspan relates primarily to obstruction separation criteria involving taxiways and taxilanes. Examples of twelve relevant types of fixed-wing aircraft and rotor wing aircraft that are expected to operate regularly or on an infrequent basis from Lunken Airport are shown in Appendix A Typical Aircraft Types.

Source: FAA Advisory Circular 150/5300-13, "Airport Design"

The historical critical design aircraft that regularly operate from Lunken Airport (minimum of 250 departures per year) have been the larger corporate jets, which include the FAA Design Group III Gulfstream-IV (96.5 feet wing span). It is envisioned that corporate aircraft types in this FAA Design Group-III will continue to be the dominant design aircraft for the foreseeable future at Lunken Airport. The trend toward larger Group III corporate aircraft follows the historic business trends of large international corporations.

An example of a successful manufacture of large corporate aircraft is the Gulfstream line of corporate aircraft. In 1958, Gulfstream introduced the G-I twin engine turboprop corporate aircraft that was designed to replace the Douglas DC-3. The G-I has a range of 2,500 miles, carries 19 passengers and cruises at 280 mph. The most recent twin engine turbofan G-550 model has a range of 8,000 miles, carries 19 passengers and cruises at 650 mph.

As aircraft technology has progressed, some large corporations have started to utilize derivatives of commercial passenger aircraft. Currently both Boeing with the Boeing Business jet (BBJ) and Airbus with the Airbus Corporate Jetliner (ACJ) are also providing aircraft for the corporate market. These large cabin aircraft have ranges of over 7,000 miles and fly at over 650 mph. For 15-hour trips, the larger cabin sizes combined with the commonality with airline fleets makes these large corporate aircraft a natural progression in the flight departments of major international corporations. A relativity small market exists for these large corporate jets that have gross weights of approximately 170,000 pounds and cost over \$50 million. At the later end of the 20-year planning period, Group III BBJ type of corporate aircraft may regularly operate from Lunken Airport.

EXISTING CORPORATE AIRCRAFT TYPES: Numerous Group III corporate jet aircraft types operate from Lunken Airport on a regular basis, including the G-IV, Fokker 70, the Falcon 2000 and others. Of these, the largest Group-III corporate aircraft type that is based at Lunken Airport is the Gulfstream-IV twin engine turbojet. Technical specifications from aircraft manufacture representatives and the 2004 Aviation Week & Space Technology Source Book were utilized as a data source for the following Gulfstream-IV specifications:

GULFSTREAM-IV SPECIFICATIONS

(Existing Group III Critical Aircraft)

Landing Gear Type: Dual Wheel (DW)

Wing Span: 77.8 feet
 Length: 88.3 feet
 Height: 24.4 feet
 Empty Weight: 42,500 lbs.

Max. Take-off

Weight (MTOW): 76,300 lbs.Approach Speed 135 knots

• Runway Landing Length: 3,200 feet (Max. Landing Weight

(MLW), Std. 60d Day)

• Runway Take-Off Length: 5,280 feet (MTOW, Std 60d Day)

Fuel Capacity: 4,370 gals.
Max. Range: 5,078 miles
Engines: Two Turbo-Fans

Other large aircraft that operate into Lunken Airport on an infrequent basis (landing waiver required) include the twin-engine Group-IV USAF Boeing B-757-200 that is utilized by government officials from Washington, D.C. This B-757 only operates into Lunken Airport 3 - 4 times per year, and for security purposes, airport management parks the aircraft on Taxiway 'B' near the threshold of Runway 3R. Selected specifications for the B-757 include the following:

B-757 SPECIFICATIONS

Landing Gear Type: Dual Tandem Wheel (DTW)

Wing Span: 124.8 feetLength: 155.1 feet

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Height: 44.5 feetEmpty Weight: 132,280 lbs.

Max. Take-Off Weight: 240,000 lbs. (DTW)

Runway Landing Length: 4,500 feet (MLW, Std 60d Day)
 Runway Take-Off Length: 7,000 feet (MTOW, Std 60d Day)

Fuel Capacity: 11,276 gals.
Max. Range: 4,800 miles
Engines: Two Turbo Fans
Seating: 155-190 passengers

POTENTIAL CORPORATE AIRCRAFT TYPES: The selection of a design year (2022) FAA Design Group-III corporate jet aircraft that potentially will be the largest typical aircraft type that will operate from Lunken Airport on a regular basis (minimum of 250 departures per year) was based on discussions with air traffic control personnel, FBOs, corporate pilots, airport management, and relevant aviation industry publications. This analysis resulted in the selection of two corporate aircraft types that are in production and likely will regularly operate from Lunken Airport through out the 20-year planning period. For the short term (5-years), the new Gulfstream G-550 which is going into service in 2004, is scheduled to operate from Lunken Airport before 2005. Selected technical specifications for the G-550 are as follows:

GULFSTREAM G-550 SPECIFICATIONS

(Short Term Group III Critical aircraft)

Landing Gear Type: Dual Wheel (DW)

• Wing Span : 93.5 feet

• Length: 96.4 feet

• Height: 25.8 feet

• Empty Weight: 48,300 lbs.

• Max Take-off Wt. (MTOW 91,400 lbs.

• Approach Speed 135 knots

• Runway Landing Length: 2,770 feet (MTOW, Std. 60d Day)

• Runway Take-Off Length: 5,910 feet (MTOW, Std 60d Day)

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7,000 feet (MTOW, Hot 86d Day)

Fuel Capacity: 6,119 GALS.Max. Range: 8,130 miles

Engines: Two Turbo-Fans

Other large body corporate aircraft types that are anticipated to operate from Lunken Airport on a regular bases (250 departures per year) include the recently certified (1998) Boeing Business Jet (BBJ). The BBJ was launched in 1996 as a joint venture between Boeing and General Electric. Designed for corporate and individual use, the BBJ is a high performance derivative of the B-737-700. The BBJ marries the B-737-700 fuselage with the stronger wing and landing gear of the B-737-800. For the long term (20-years), it is anticipated that the Boeing BBJ may become the critical Group III aircraft type based on a minimum of 250 annual departures. Technical specifications for the BBJ are as follows:

Boeing-BBJ SPECIFICATIONS

(Long Range Group III Critical Aircraft)

Landing Gear Type: Dual Wheel (DW)

Wing Span: 117.4 feet
Length: 110.3 feet
Height: 41.2 feet
Empty Weight: 94,570 lbs.
Max. Take-Off Weight: 171,000 lbs
Approach Speed 115 knots

Runway Landing Length: 2,550 feet (MLW, Std 60d Day)
Runway Take-off Length: 6,100 feet (MTOW, Std 60d Day)
7,000 feet (MTOW, Hot 86d Day)

Fuel Capacity: 6,878 gals.
Max. Range: 7,135 miles
Engines: Two Turbofans

<u>POTENTIAL REGIONAL COMMUTER AIRCRAFT TYPES</u>: The analysis of the feasibility of scheduled regional/commuter service at Lunken Airport during the 20-year planning period requires that a specific aircraft type be

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selected for airport facilities planning purposes. An analysis of the typical short-haul markets that potentially could be served from Lunken Airport includes Cleveland, Chicago, St Louis and Washington, D.C. A review of the typical FAA Design Group III aircraft types that existing regional commuter airlines are utilizing for the 300 to 500 mile short-haul stage lengths includes 19 - 34 seat turboprop aircraft (e.g., Metro III, Saab 340 and the turbojet Dornier Do-328, and the 50-seat Canadair RJ turbojet). Selected technical specifications for a typical 33 passenger twin engine turbojet regional commuter aircraft that may operate from Lunken Airport during the 20-year planning period include the Do-328 Jet. The Do-328 can operate with lesser number of passengers, in order to meet Lunken's 30 passenger limit FAR Part 139 certification requirements. Selected specifications for the Do-328 Jet are as follows:

Dornier Do-328 Jet SPECIFICATIONS

(Typical Group III Turbo-Jet Regional Commuter Aircraft)

Landing Gear Type: Dual Wheel (DW)

Wing Span: 68.8 feet
Length: 69.7 feet
Height: 23.1 feet
Empty Weight: 20,000 lbs.
Max. Take-Off Weight: 33,843 lbs.

Runway Landing Length: 3,825 feet (MLW, Std 60d Day)
 Runway Take-Off Length: 3,570 feet (MTOW, Std 60d Day)

4,000 feet (MTOW, Hot 86d Day)

Fuel Capacity: 800 gals.
Max. Range: 1,000 miles
Engines: Two Turbo Fans

Passengers: 33

Other Group III aircraft types that would potentially be utilized by a regional commuter operation include the 19-seat BAE Jetstream, the 19-seat Beech 1900, and the 30-seat ENB 120. The typical largest turboprop aircraft that likely will be operating during the 20-year planning period is

the 30-seat Saab 340. Selected technical specifications for the SAAB 340 are as follows:

SAAB 340 SPECIFICATIONS

(Typical Group III Turbo-Prop Regional Commuter Aircraft)

Landing Gear Type: Dual Wheel (DW)

Wing Span: 70.3 feet
Length: 64.6 feet
Height: 22.8 feet
Empty Weight: 18,600 lbs.
Max. Take-Off Weight: 29,000 lbs.

Runway Landing Length: 3,830 feet (MLW, Std 60d Day)
 Runway Take-Off Length: 3,258 feet (MTOW, Std 60d Day)

Fuel Capacity: 850 gals.
Max. Range: 1,260 miles
Engines: Two Turboprops

Passengers: 30

If within the 20-year planning period, a larger Group III corporate jet than the 91,400 pound (MTOW) G-550 operates from Lunken Airport more than 250 departures per year, the City of Cincinnati could then consider increasing the pavement strength of Runway 3R-21L to a strength that will safely support the proven Group-III aircraft type.

3.2.5 Runway and Taxiway Strength

The relationship between runway and taxiway pavement strength and the design aircraft that potentially will operate from Lunken Airport over the next 20 years is determined by a combination of the following four airport design factors:

- Pavement and Strength
- Existing Corporate Aircraft Types
- Potential Corporate Aircraft Types
- Potential Commuter Aircraft Types

PAVEMENT STRENGTH: The published weight bearing capacity of Runway 3R-21L is 60,000 pounds single wheel (S), 70,000 pounds dual wheel (DW), and 140,000 pound dual tandem (DT); Runway 7-25 is 11,000 pounds-S, 20,000 pounds-DW, 55,000 pounds-DT; and Runway 3L-21R is 11,000 pounds-S. These pavement capacities concur with the FAA's 5010 Airport Master Record (2003). Based on Lunken Airport's proposed FAA classification of Approach Category C (121-140 knots) and Airplane Design Group III wing span (79 feet up to 118 feet), Runways 3R-21L and 7-25 and the north and south airfield connecting taxiways will have to accommodate the Gulfstream G-500 design aircraft, which has a maximum take-off weight of 91,400 pounds (dual wheel gear). To allow for modifications of the G-550 during the 20-year planning period, the pavement strength for Runway 3R-21L and the connecting taxiways are planned to be set at 100.000 pounds (duel wheel). The pavement strength of the other two runways (3L-21R and 7-25) are not required to be upgraded.

3.2.6 Runway Length

Selecting a design runway length is one of the most important elements of long-range airport planning. The runway must be long enough to allow safe landings and takeoffs by current aircraft types as well as future aircraft that are expected to use the Airport on a regular basis. It must accommodate differences in pilot skill and a variety of aircraft types and special operational requirements.

The following factors influence required runway length:

- Performance characteristics of aircraft using the Airport.
- Landing and takeoff gross weights of the critical aircraft.
- Elevation of the Airport.
- Average maximum air temperature at the Airport.
- Runway gradient.

Other factors causing variations in required runway length are: humidity, winds, and the nature and condition of the runway surface.

RUNWAY LENGTH 3R-21L: Runway length requirements at Lunken Airport were determined by using the selected design aircraft's general specifications and the generalized characteristics of the entire general aviation fleet. The two selected Group-III corporate design aircraft types that potentially will have a minimum of 250 annual departures per year (average 1.4 flights per day) include the G-550 (short term) and the Boeing-BBJ (long term). Based on manufacturer specifications, and the Airport elevation of 484 MSL, the runway takeoff length requirements for these two Group III corporate aircraft are as follows:

<u>AIRCRAFT</u> <u>TAKEOFF LENGTH</u>

<u>Gulfstream G-550</u>: <u>5,910 feet</u>: (60 degree F, 91,400 lbs. MTOW,

Dry Runway (R/W))

7,000 feet: (86 degree F, MTOW, Wet R/W)

Boeing –BBJ: 6,100 feet: (60 degree F, 171,000 lbs. MTOW,

Dry R/W)

7,000 feet: (86 degree F, MTOW, Wet R/W)

the optional length for Runway 3R-21L is based on FAA runway design criteria shown in Advisory Circular 150/5325-4, *Runway Length Requirements For Airport Design (Par. 5, Pg. 3)*, which includes the following critical aircraft runway determination factors:

- Selected airplane which the runway is to accommodate.
- The longest nonstop distance expected to be flown from the airport at least 250 times a year by the selected airplane.
- Airport elevation above mean sea level.
- Mean daily maximum temperature (F) for the hottest month.
- Aircraft maximum takeoff weight.
- Effective runway gradient.

The evaluation of these factors indicates that Runway 3R/21L should be extended by 899 feet for a total length of 7,000 feet, in order to accommodate the new generation of corporate aircraft such as the G-550.

If FAA financial participation in the extension of Runway 3R-21L is pursued, a user of the G-550, the Boeing-BBJ, or other Category III aircraft type will have to verify the runway requirements of a specific aircraft type that will regularly utilize Runway 3R-21L. Project justification variables other than the 250 departures per year, as suggested by the FAA planning criteria; include such factors as corporate flight department operations standards, aircraft insurance requirements, and other factors specific to the community that the airport serves.

The G-550, the Boeing-BBJ and other new corporate aircraft types have ranges in excess of 7,000 nautical miles, and it is anticipated that within the 20-year planning period, these long-range corporate aircraft types will be using Lunken Airport on a regular basis. Potentially, Runway 3L-21R could support corporate aircraft flights to Asia, which would be a 6,969 mile non-stop flight from Cincinnati to Hong Kong.

The existing 6,101-foot Runway 3R-21L adequately serves the existing critical Group-III corporate aircraft, which is the G-IV. The current length of Runway 3R-21L also adequately serves both design year aircraft types (G-550 and BBJ) during FAA standard operating conditions, which include a 60 degree F day, 60 percent useful payload, and dry runway conditions. However, on hot days at maximum take-off weight these aircraft types cannot operate on the existing 6,101-foot length of Runway 3R/21L.

FAA runway length criteria contained in Advisory Circular 150/5300-13, *Airport Design,* indicates that for generalized runway takeoff requirements

for small general aviation aircraft and corporate turbojet aircraft under 60,000 pounds, the following runway lengths are required:

- 4,700 feet for 75 percent of the fleet at 60 percent useful load
- 5,700 feet for 100 percent of the fleet at 60 percent useful load

The primary Runway 3R-21L has sufficient length to accommodate the existing design aircraft as well as 100 percent of the less than 60,000 pound turbojet fleet at 60 percent useful payload. The crosswind Runway 7-25 has sufficient length (5,128 feet) to accommodate over 75 percent of the under-60,000 pound turbojet fleet at 60 percent useful load. The secondary parallel Runway 3L-21R exceeds the FAA's requirement of 3,200 feet for a basic utility Stage-II runway by 602 feet and requires no additional length.

3.2.7 Geometric Design Standards

Based on their anticipated use, runways and taxiways at Lunken Airport should be designed in accordance with the FAA standards presented in **Table 3-5**. For example, the more demanding Group III category aircraft standards should supersede the small general aviation aircraft standards when the runway or taxiway is expected to be utilized by Group III aircraft.

All proposed improvements to the airfield will incorporate these standards except in cases where existing conditions make it impractical to do so. Several areas of the airfield do not meet or exceed the minimum design standards.

These include:

 Hangar Three, which is within the extended Runway Safety Area (RSA-600 feet by 300 feet) of Runway 7, should be removed. Airport Road and an airport maintenance building are also within the Runway 7 RSA and should be relocated.

- The Visual Runway Protection Zone (RPZ) (1,000 feet x 500 feet x 700 feet) for Runway 7 extends off the Airport. If practical, this property should be under positive control of the Airport through either fee simple land acquisition or the acquisition of airspace obstruction control easements. If fee simple acquisition is undertaken, this project would require the relocation of a portion of the Ohio River flood control levee and the removal of three buildings located at the intersection of Wilmer Avenue and Kellogg Avenue. The acquisition of Avigation easements on adjacent airport properties would require limitations of the use of the property that may include; compatible land use requirements, aircraft noise limits, the maximum heights of structures, and other land uses that may affect the safety of the airport.
- Due to the limited 40-foot height of the Control Tower, the north section of the original Runway 21R is not visible from the Control Tower. The FAA has therefore required the relocation of the approach threshold for Runway 21L. Corporate aircraft that taxi across this section of the airport are not visible from the Control Tower.

		TABLE 3-5	3-5			
	Cincinnati	Cincinnati Municipal Airport-Lunken Field DESIGN CRITERIA	port-Lunken TERIA	Field		
	Runway	Runway 3L-21R	Runwa	Runway 7-25	Runway 3R-21L	3R-21L
Criteria	Existing	ARC B-II Required	Existing	ARC B-III Required	Existing	ARC C-III Required
Runway Width	100,	75'	100'	100'	150'	100'
Runway Centerline to:						
-Taxiway Centerline	Ϋ́	240'	350'	400,	Ϋ́	400,
-Aircraft Parking Area	250'	250'	444'	500'	500'	200,
-Parallel Runway to Centerline	2,100'	,002	ΑN	,002	2,100'	,002
Runway Object-Free Area						
-Width	500'	500'	,008	,008	,008	,008
-Length Beyond Runway End	300'	300,	,009	,009	1000'	1000,
Runway Safety Area						
-Width	150'	150'	300,	300,	500'	200,
-Length Beyond Runway End	300'	300'	600'	600'	1000'	1000'
Parallel Taxiway Centerline to:						
-Parallel Taxiway/Taxilane	105	105	Ϋ́	152	ΑN	152
-Fixed or Movable Object	66	99	93	93	93	93
Taxiway Width	NA	32,	75'	20,	NA	,09
Taxiway Object-Free Area Width	NA	131	186'	186'	186'	186'
Taxiway Safety Area Width	NA	79'	118'	118'	118'	118'
Runway Blast Pad						
-Length	Ϋ́	150'	Ϋ́	200,	Ϋ́Z	200,
-Width	NA	95'	NA	140'	NA	140'

Source: FAA Advisory Circular 150/5300-13 Note: ARC-FAA Aircraft Reference Code.

 A portion of a golf course green and tee, and bike trail are within the Runway 25 RSA. These obstructions are being relocated outside the RSA at this time.

These airport design deficiencies, as well as all other recommended airfield development projects, will be planned to conform to the FAA design requirements shown in Table 3-6. The existing airfield deficiencies will be addressed by a phased mitigation process over the 20-year planning period.

3.2.8 Taxiway Configuration

The Airport's existing taxiway configuration includes Taxiway 'C', which serves the Airport Road hangar area, and Taxiway 'A', which supports the Wilmer Avenue hangar area. With the relatively low traffic volumes on these two taxiways, in combination with the air traffic control tower management, the two taxiways provide adequate runway access routes for the system of three runways. As determined by the airfield capacity analysis, there are areas where the taxiway system can be more efficient as well as provide a safer operating environment.

The addition of a taxiway parallel to Runway 3R-21L with 45 degree runway exits near the middle of the runway would increase the airfield's capacity by approximately 18.5 percent, as well as eliminate numerous unnecessary runway crossings for aircraft going to and from the two hangar development areas. Other areas of concern relate to the requirement for aircraft by-pass aprons along Taxiway 'C', which will provide for two-way aircraft taxiing and lessen the workload of the Air Traffic Control personnel. These aircraft operational safety- and capacity-related issues will be examined in Chapter 4.0 Airfield and Landside Alternatives Analysis.

3.2.9 Runway Instrumentation

The airfield currently has a complete system of instrumentation and lighting that supports the Category-I Instrument Landing System (CAT-I ILS). The CAT-I ILS provides pilots approaching Runway 21L with a 200-foot Minimum Decision Height (MDH). Based on interviews with the Air Traffic Control Tower personnel and corporate aircraft operators, safety considerations during south-flow weather patterns dictate the need for an additional Cat-I ILS precision approach from the south for Runway 3R.

In the past, east-west air traffic at CVG that operated in conflicting approaches to the north-south air traffic at Lunken Airport had a negative effect on operations south of Lunken Airport. Lunken Airport-bound traffic was required to be vectored 15 miles to the east of Lunken Airport. With the new system of triple independent IFR parallel north-south runways at CVG (18R/36L-18L/36R-17/35), the peak north-south operating period conflicting approaches and departures with Lunken Airport will be reduced, thus minimizing the traffic conflicts between the two airports.

Only minor IFR capacity increases at Lunken Airport will be gained with this proposed CAT-I approach to Runway 3R during the seasonal north-flow weather patterns, but the enhanced safety and operational efficiency factors may justify the development of the system. Although the need for a CAT-I ILS approach for Runway 3R has been shown, the practicality of implementing this project may not be feasible due to the 400-foot-high hills located to the south of the Ohio River.

Other suggested changes to the runway instrumentation include the potential upgrade of the existing CAT-I ILS system for Runway 21L (200-foot MDA) to CAT-II ILS that has a 100-foot MDA. The feasibility of

installing a CAT-II ILS will be determined by the FAA. Preliminary analysis indicates that a sufficient number of scheduled aircraft operations during CAT-II weather may not likely occur during the 20-year planning period. Other practical factors that may effect the ability to implement a CAT-II ILS for Runway 21L are that the 400-foot high hills that surround Lunken Airport on three sides will likely effect the CAT-II aircraft missed approach procedures. Also, for a CAT-II ILS to be useful, the runway lighting system will have to be significantly expanded, the system would have to be maintained on a daily basis; pilots would require special certification and the aircraft would have to be certified to show that single-engine out procedures can meet CAT-II missed approach obstruction clearance criteria. These issues will be addressed in the Airport Layout Plans Chapter.

3.3 Landside Airport Facility Requirements

The following sections describe the landside facilities that would be required to meet the projected aviation demand for the 20-year planning period. The facility requirements do not include the replacement or restoration of existing facilities. Should any existing facility need replacement, relocation, or rehabilitation, this need would be additional to requirements noted in this section. General planning criteria were used to identify total land, building, and apron requirements for each functional land use area. It should also be noted that new facilities at Lunken Airport would not be considered by the City of Cincinnati unless the actual growth in operational demand approaches the aviation activity forecasts.

In determining the long-term landside facility requirements, the following five major functional areas are utilized for land use planning purposes at Lunken Airport.

Corporate Facility Requirements

- Fixed Base Operator (FBO) Facility Requirements
- Specialized Aviation Services Operator (SASO) Requirements
- Terminal Facility Requirements
- Airport Support Requirements

These five functional areas and the specific land lease areas within each functional area have been previously depicted on Exhibit 1-5, Exhibit 1-6, and Table 1-3.

3.3.1 Corporate Facility Requirements

The existing eight corporate lease areas are located along Wilmer Avenue. These two-acre to four-acre lease areas are utilized for the storage, maintenance, and operation of corporate aircraft. Conventional hangars are the primary storage method for all based corporate aircraft at Lunken Airport. Typically each corporate hangar holds from two to six twin-engine jets and twin-engine turboprop aircraft. As part of the lease area agreements, the City of Cincinnati allows certain corporate lease areas to have underground fuel storage facilities (30,000 to 60,000 gallons). Because the major Airport tenants have on-site fuel storage, no central fuel farm exists at the Airport.

Other typical corporate lease area facilities include connector taxiways to Taxiway A, an aircraft parking apron of approximately the same size as the hangar, employee parking for approximately 20 cars, a single-lane access road to Wilmer Avenue, and tenant-owned perimeter security systems. City of Cincinnati security requirements require that all airfield access gates be under positive control and that all visitors to the corporate lease areas be controlled by the corporate tenant.

As previously shown on Exhibit 1-5, the existing Wilmer Avenue corporate hangar development area includes approximately 26 acres of property that supports an estimated 40 corporate jet aircraft. The average corporate lease area contains approximately two to four acres. The average corporate hangar contains approximately 24,000 total square feet which houses approximately five corporate aircraft.

The determination of the need for long-range corporate hangars is based on the identified development plans of the existing corporate flight departments, forecasts of additional based aircraft, and the potential demand for new corporate lease areas. In the design year 2022, it is projected that 87 additional aircraft (see Table 2-4) will be based at Lunken Airport. These include:

- 12 Single Engine Aircraft
- 11 Twin Engine Turboprop Aircraft
- 63 Corporate Jets
- 1 Helicopter

Of these 87 projected aircraft, it is assumed that approximately 50 percent (30) of the corporate jets will be based in existing and future corporate hangars. Assuming that 15 projected corporate jets are stored in the existing eight lease areas, and assuming that each future four-acre corporate lease area will accommodate five corporate jets, results in a future corporate lease area requirement of 12 acres or *three additional four-acre parcels*.

Based on the typical corporate flight department at Lunken Airport, each additional four-acre lease area module would include the following facility requirements:

- 4.0-acre Lease Area
- 5 Corporate Jet Aircraft

- 24,000 square -foot Maintenance Hangar
- 25,000 square -foot Aircraft Apron
- 20 Automobile Parking Spaces
- 20,000 gallon Underground Fuel Storage

As previously shown on Exhibit 1-5, no land is available for the development of additional corporate lease areas along Wilmer Avenue or along Airport Road. Therefore, in the following Chapter 4.0, the feasibility of developing additional corporate expansion areas will be considered in other sections of Airport property, including expansion into the golf course along Wilmer Avenue and the development of the mid-field area between the two parallel runways.

3.3.2 Fixed Base Operator (FBO) Facility Requirements

Two full-service FBO's provide aviation services and products to the aviation community at Lunken Airport. FBO services include aircraft fueling (both avgas and jet fuel) for both based and itinerant aircraft, aircraft storage in hangars and on aprons, aircraft maintenance, aircraft rental, aircraft sales, and pilot flight training. For 24-hour fueling capability, some tenants suggest that the FBO's provide a self-service fueling facility. Other related services include rental cars, pilot and passenger waiting areas, food service, weather reporting, office space, meeting rooms, and aircraft and passenger security. Like the corporate land lease areas, FAR Part 139 requires that the FBOs maintain perimeter security fencing and the positive control of all persons that require access to the aircraft parking aprons and aircraft. The two FBO lease areas contain approximately ten acres each.

Based on the projected growth rate in general aviation operations of 1.8 percent over the 20-year planning period, combined with the stability and size of the two existing FBOs, it is assumed in this study that no new full-service FBOs will enter the market at Lunken Airport.

The two FBOs that serve Lunken Airport include Midwest Jet Center, which is located along Wilmer Avenue, and Million Air, which is located at the east end of Airport Road.

MIDWEST JET CENTER: This FBO operates from a 10.92-acre lease area along Wilmer Avenue. The lease area contains a terminal, maintenance hangar, flight school, aircraft parking apron, underground fuel storage, and approximately 49 based aircraft. The Midwest Jet Center lease area is very constrained. Due to the recent expansion of the Lunken terminal apron to the south, and the corporate lease areas to the north, Midwest Jet Center has very few options for the expansion of their operation. Currently Midwest Jet Center is relocating the flight school and is planning for the construction of a new 30,000 square-foot hangar on this 1.4-acre site.

Based on the projected 87 additional based aircraft, combined with the fact that the majority of the forecasted growth is corporate jet traffic, it is assumed that Midwest Jet Center will capture approximately 10 additional corporate jet aircraft and approximately 50 percent of the projected itinerant operations, which totals to approximately 30 additional daily itinerant operations by the year 2022.

Assuming an estimated five peak hour itinerant corporate jet arrivals and ten peak hour small aircraft arrivals in 2022, and utilizing planning factors of 15,000 square feet per corporate jet aircraft and 2,500 square feet per small aircraft, an itinerant apron requirement of approximately 100,000 square feet is recommended.

With an existing itinerant apron of only 60,000 square feet, results in a future itinerant apron requirement of approximately 40,000 square feet.

When the constrained Midwest Jet Center apron facilities are combined with the requirement for at least one additional major aircraft storage hangar, the result is an additional land lease requirement of approximately 50 percent, or <u>5.0 additional acres of land</u>. The estimated additional FBO facility requirements to be developed on the 5.0-acre Midwest Jet Center expansion area would include:

- 5.0-acre Lease Expansion Area
- Space for 10 Additional Corporate Jet Based Aircraft
- 30,000 square -foot Aircraft Maintenance Hangar
- 40,000 square -foot Aircraft Apron Expansion
- 20,000 gallon Underground Fuel Storage
- 50 Automobile Parking Spaces

The feasibility of expanding the existing Midwest Jet Center lease area by five acres or relocating Midwest Jet Center to another lease area on the Airport will be evaluated in Chapter 4.0.

MILLION AIR: Million Air operates a full service FBO on a 7.6-acre lease area located on the east end of Airport Road. Like Midwest Jet Center, the Million Air FBO operation is very constrained, and further development is severely limited by the recently constructed aircraft storage hangars on both sides of the Million Air lease area. Million Air is also planning to construct a new aircraft maintenance hangar on their existing lease area in 2004

Similar to Midwest Jet Center, Million Air is expected to capture 50 percent of the projected itinerant traffic and 10 additional based corporate jets aircraft over the 20-year planning period. This would require a lease <u>expansion area of approximately six acres</u>, which is approximately double Million Air's current lease area. The estimated additional FBO facility

3.0 DEMAND/CAPACITY AND FACILITY REQUIREMENTS

requirements that will be developed in addition to the existing Million Air lease area include:

- 6.0-acre Lease Expansion Area
- Space for 10 Additional Corporate Jet Based Aircraft
- 30,000 square -foot Aircraft Maintenance Hangar
- 40,000 square -foot Aircraft Apron Expansion
- 20,000 gallon Underground Fuel Storage
- 50 Automobile Parking Spaces

Unlike the Midwest Jet Center FBO lease Area, the Million Air lease area has the ability to be expanded if Taxiway 'C' is relocated to the north. As part of the alternatives analysis in Chapter 4.0, options for the expansion of the existing Million Air lease area will be evaluated.

3.3.3 Specialized Aviation Services Operator (SASO) Facility Requirements

In addition to the FBOs and corporate lease holders located at the Airport, five specialized commercial aviation leaseholders identified as SASOs provide a wide range of aviation services to aircraft operators. These services include aircraft engine and avionics maintenance, air charter passenger and air freight service, flight training schools, T-Hangar rental, and aircraft management services. Like the Corporate and FBOs lease areas, the SASOs lease area tenants are required to provide perimeter security for their lease areas and visitors.

As shown previously on Exhibit 1-6, the Airport Road SASO hangar development area includes approximately 34 acres of property which can accommodate approximately 250 based aircraft.

The average SASO lease area contains approximately 4.0 acres and the average lease area supports approximately 20 based aircraft. The determination of the need to provide expanded long-range SASO lease

areas is based on the identified expansion plans of the existing SASOs, and the potential demand for new SASO lease areas. The only identified significant need for SASO hangar space is Lease Area 50, which will accommodate 90 to100 additional single engine and small twin engine aircraft. Of the 87 additional projected based aircraft by 2022, the SASOs are assumed to provide hangar space for 37 additional aircraft, including 13 corporate jets.

With the build-out of Lease Area 50, no additional land is available along Airport Road that will support potential new SASO lease areas. Approximately five of the SASO lease areas along Airport Road could be expanded to the north if Taxiway 'C' is relocated. The need for additional SASO lease areas is based on several considerations:

- Potential relocation of based aircraft from Blue Ash Airport, or other airports in the area.
- Restricted SASO lease areas at CVG.
- Trends toward larger corporate aircraft that require higher levels of specialized maintenance.
- Potential technical support required for regional/commuter aircraft.
- The trend of new specialized aircraft service companies that split off from existing companies.
- Expansion of national aviation service companies to new markets.

In order to address these various factors related to the demand for SASO hangar and aircraft apron space at Lunken Airport over the 20-year planning period, it is assumed that one additional 4.0-acre SASO lease area will be required every seven years, which results in the requirement of three additional 4.0 acre SASO development sites for a total of 12 additional acres of property. Based on the typical existing SASO facilities, each additional 4.0-acre SASO lease area module would include the following facility requirements:

- 4.0-acre lease area
- Space for 9 additional based aircraft

- 30,000 square-foot hangar
- 70,000 square-foot apron

Taking into consideration that no additional property is available along Airport Road, the options for accommodating the long-range requirement for an additional 12 acres of SASO lease areas will consider the relocation of Taxiway 'C' and development within the mid-field area.

3.3.4 Scheduled Commuter Terminal Facility Requirements

The terminal area includes the terminal building, transient aircraft parking apron, and public parking areas. A recent proposal has been received by the City for the operation of a scheduled charter passenger service that will operate from the north wing of the terminal. This proposed charter operation, scheduled to begin in 2004, will initially include passenger service with 19-30 passenger turboprop aircraft, and in the future is proposed to expand the operation to include 30 passenger turboprops or regional jets. With modifications, this scheduled charter operation can be accommodated in the existing terminal so as to support the projected 18,720 annual enplaned passengers in 2022.

As previously shown on Exhibit 1-7, the terminal building at Lunken Airport has approximately 20,000 square feet of space on two levels and is fully occupied by several organizations and businesses, including a restaurant, charter and commuter passenger holdroom, a flight school, a flying club, and Airport administration offices. The terminal was constructed in the mid-1930s and has been expanded and remodeled on a continuous basis.

As shown on **Exhibit 3-2**, the recently remodeled north wing of the terminal contains approximately 2,000 square feet of space. The passenger processing facilities that are included in this space include:

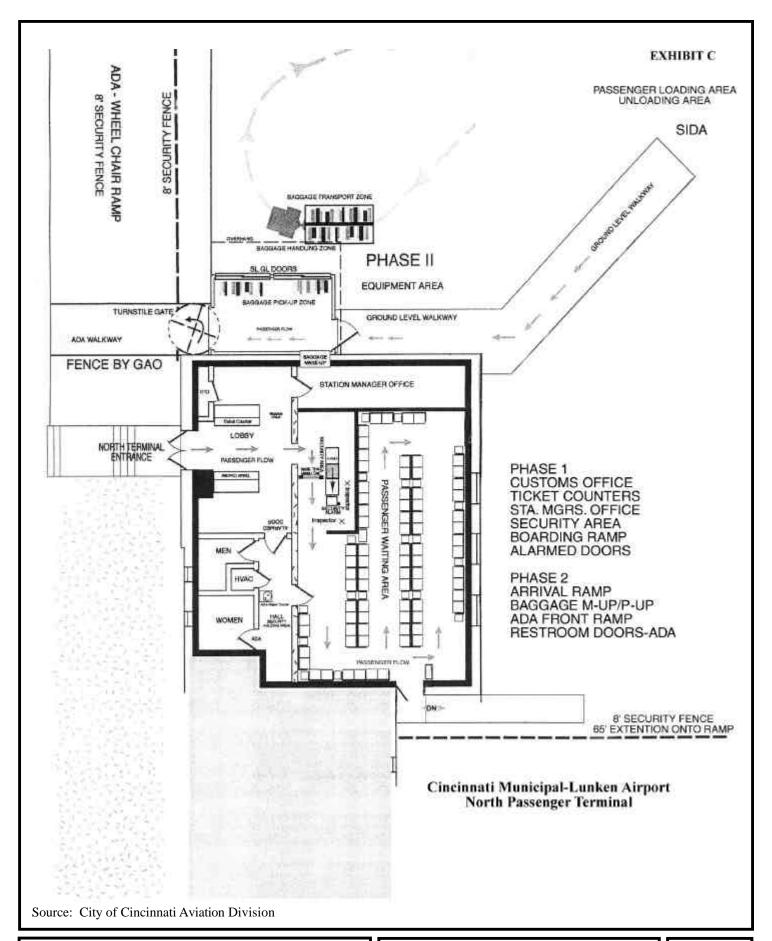
3.0 DEMAND/CAPACITY AND FACILITY REQUIREMENTS

- Two aircraft parking positions
- Two ticket counter positions
- One passenger and baggage security screening device
- Seating for 56 passengers
- Restroom facilities for men and women
- Baggage processing area
- Rental car counter
- Curbfront

Based on the current size of the existing aircraft parking areas and the existing ticketing lobby area, it is estimated that the maximum peak hour capacity of this facility would support the simultaneous use of two 30-seat turboprop aircraft. The existing multi-function metered parking spaces in front of the terminal may be utilized by commuter passengers on a short-term basis. However, for an efficient curb-front operation, passenger pick-up and drop-off areas should be provided.

As shown on **Exhibit 3-3**, the existing north terminal apron, which contains approximately 54,000 square feet, can adequately accommodate two 30 passenger commuter aircraft. If additional aircraft parking positions are required, the main terminal apron, which contains approximately 60,000 square feet, could be utilized for additional scheduled commuter operations.

Also shown on Exhibit 3-3 is a plan for the development of a 184 space parking lot that is scheduled to be constructed in 2004. This parking lot will serve short term and long term terminal passenger as well as bike trail users.

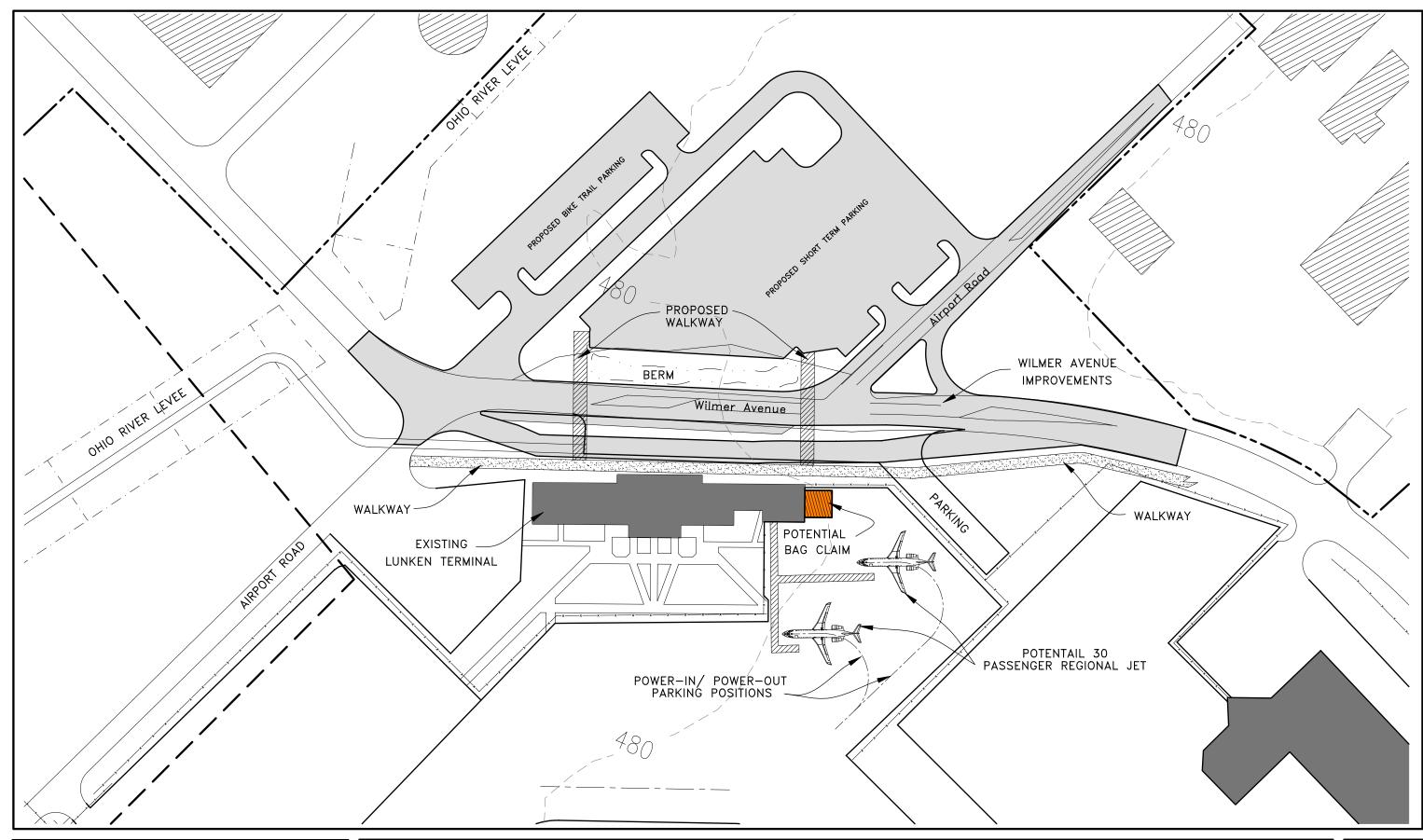




NORTH PASSENGER TERMINAL

EXHIBIT

3-2





50° 0 100°

Proposed City of Cincinnati Terminal Site Plan EXHIBIT 3-3

3.3.5 Airport Support Facilities Requirements

As identified earlier on Table 1-3, there are six airport support facilities at the Airport. These include:

- Airport Rescue and Fire Fighting Facility (ARFF)
- Air Traffic Control Tower (ATCT)
- Airfield Maintenance Facilities
- Airport Access
- Airfield Security
- Lunken Playfield

Aircraft Rescue and Fire Fighting Facility (ARFF): The joint-use Airport Rescue and Fire Fighting Facility (ARFF) serve Lunken Airport as well as the surrounding communities. This facility is located near the center of the airfield and adjacent to Wilmer Avenue. The size and condition of this five-bay facility are considered adequate for the 20-year planning period.

Air Traffic Control Tower (ATCT): The privately contracted ATCT has a Control Tower cab size and number of controllers that are adequate to serve the demand of Airport users given the existing Airport configuration and aircraft operational demand levels. One operational issue with the ATCT is controller visibility of a 900-foot section of taxiway located in the approach area of Runway 21R. This area of the Airport is not visible from the 40-foot high ATCT and this situation has required the relocation of the threshold of Runway end 21R. This non-visibility area of the airfield also results in the controller not having visibility of the three most northerly corporate hangar aprons that are located along Wilmer Avenue. Due to the Control Tower being over 40 years old, not having an elevator, and the airfield safety issues related to the Runway 21R relocated runway, a site for a new control tower with a height of approximately 60 feet will be evaluated in the alternatives analysis element of this study.

<u>Airfield Maintenance Facilities:</u> The two existing and one proposed airfield maintenance buildings, while adequate for long-term needs, should be consolidated into one site at the east end of Airport Road. In addition, the maintenance storage building located in the Runway Protection Zone (RPZ) for Runway 7 should be relocated in order for the Airport to comply with FAA runway safety criteria.

Airport Access: As previously shown on Exhibit 3-3, Airport access is provided by Wilmer Avenue which runs between Beechmont Avenue and Kellogg Avenue. The proximity of Wilmer Avenue to the terminal building and the Airport Road intersection hinders the safe access of both passengers and vehicles that operate in the terminal area. The City of Cincinnati has proposed that this access issue be resolved by reconfiguring the roadways in the immediate area of the terminal building and expanding the public parking lot to the vacant area located west of Wilmer Avenue. This access road project and parking lot development projects are currently under study by the City.

Airport Road has insufficient capacity to support the demands that will be placed on it by future development. Airport Road will require widening, a turning circle at the east end, and a left-turn lane from Wilmer Avenue.

Airfield Security: To provide airfield security, unauthorized persons must be precluded from having access to aircraft, NAVAIDs, ATC facilities, and the runways and apron areas. Perimeter fencing that includes 8-foot and 10-foot-high chain link fencing has recently been installed, and all airfield access points are currently protected with controlled vehicle access gates. The Airport in the past has had problems with animals and unauthorized people entering the airfield. To address these problems, Airport management has established formal animal control procedures, established unauthorized personnel notification procedures with all airport

tenants, and relocated the perimeter bike/walking trail away from Airport Road.

<u>Lunken Playfield:</u> The 190-acre public playfields and 18-hole golf course, as well as the six-mile paved bike and walking trail that encircles the entire Airport, have enhanced the community by providing open space and recreational facilities. The golf course also serves as a "buffer" land use for the operational safety of Lunken Airport. This use of public property has limited the encroachment of non-compatible land uses.

One airport operational safety issue concerning the Airport and the playfield involves the location of the perimeter bikeway/walkway. Due to the bikeway/walkway passing along the narrow sidewalk directly in front of the terminal, frequent safety issues between bikers and people that are entering and exiting the terminal have occurred. To eliminate that conflict, the bikeway/walkway should be realigned from in front of the terminal to the west side of Wilmer Avenue. Currently Airport staff and the City Recreation Department are evaluating alternative routes for the walkway/bikeway.

Other airfield projects that affect the safety of the runway system include the proposed relocation of Hangar Three, located in the Runway Safety Area of Runway 7. Due to the historical significance of this structure, it has been proposed that the structure be relocated to a suitable site on Lunken Playfield. The relocated hangar could be utilized as a "Lunken Aviation Museum" and become an integral part of Lunken Airport and the region. Various sites for the museum will be evaluated in Chapter 4.0.

3.4 Facility Requirements Summary

A summary of the airfield system and landside facility requirements is presented in **Table 3-6**. The analysis of Lunken Airport's capacity to meet the projected demand for the corporate, FBO, SASO and scheduled commuter passenger service has resulted in the determination that the existing airfield system has sufficient annual and peak hour capacity for the 20-year planning period.

3.4.1 Airfield Facility Requirements

The major airfield projects that will be analyzed in the alternatives analysis element of this study are influenced by the following considerations:

- The analysis showed that the length and strength of the Airport's primary and crosswind runways can adequately accommodate the existing fleet of corporate aircraft that utilize the Airport. The runway system analysis also determined that if the projected short-term critical aircraft, the G-550 will require a runway strength (dual gear) of approximately 100,000 pounds. For the long term (2022), if the critical aircraft, the BBJ, utilizes Runway 3R-21L a minimum of 250 departures per year, the runway strength should be increased to 170,000 pounds (DW).
- If either the short-term G-550 or the long term Boeing BBJ requires its maximum takeoff weight on a hot day to reach their maximum stage length of approximately 8,000 miles, Runway 3R-21L should be extended to a length of 7,000 feet. If FAA standard-day runway length requirements are utilized, the existing 6,101-foot length of Runway 3R-21L is adequate for supporting the G-550 as well as the BBJ at MTOW.

TABLE 3-6 Cincinnati Municipal Airport- Lunken Field FACILITIES REQUIREMENTS SUMMARY

	Facility Requirements	2002	2007	2012	2022
AIRSIDE	Based Aircraft	262	290	312	349
	Critical Aircraft	Gulfstream IV	Gulfstream 550	Gulfstream 550	BBJ
	Runway Length R/W 3R-21L (feet) R/W 7-25 (feet) R/W 3L-21R (feet)	6,101 5,128 3,802	7,000 5,128 3,802	7,000 5,128 3,802	7,000 5,128 3,802
	Runway Strength Single Wheel R/W 3R-21L (lbs)	60,000	60,000	60,000	60,000
	R/W 7-25 (lbs) R/W 3L-21R (lbs) Dual Wheel	11,000 11,000	11,000 11,000	11,000 11,000	11,000 11,000
	R/W 3R-21L (lbs) R/W 7-25 (lbs) Dual Tandem	70,000 20,000	100,000 20,000	100,000 20,000	171,000 20,000
	R/W 3R-21L (lbs)	140,000	180,000	180,000	340,000
	Approach System R/W 3R (type) R/W 21L (type) R/W 3L (type) R/W 21R (type) R/W 7 (type) R/W 25 (type)	Non Precision Precision Visual Visual Visual Non Precision	Non Precision Precision Visual Visual Visual Non Precision	Non Precision Precision Visual Visual Visual Non Precision	Non Precision Precision Visual Visual Visual Non Precision
LANDSIDE	Lease Area Terminal (acres) Corporate (acres) FBO (acres) SASO (acres) TOTAL (acres)	14 26 19 34	14 30 19 38	14 34 24 42 114	14 38 30 46 128

Source: PB Aviation, 2003

- It has been suggested by airport users that additional runway instrumentation and approach lighting are required for a Category-I ILS for Runway 3R (200-foot decision height), in order to provide precision approach capability for aircraft approaches to Lunken Airport from the south during low visibility conditions when winds are from the north. It also has been suggested that a Category-II ILS (100-foot decision height) be developed for the approach to Runway 21L. The feasibility of these two ILS system upgrade projects will be analyzed in the following chapters.
- For purposes of decreasing runway crossings of Runway 3L-21R and Runway 7-25 and the head-to-head taxiway conflicts on Taxiway 'C', a full-length parallel taxiway should be provided for Runway 3R-21L.

3.0 DEMAND/CAPACITY AND FACILITY REQUIREMENTS

 For purposes of decreasing runway crossings of Runway 3L-21R and Runway 7-25, aircraft by-pass aprons should be constructed along

Taxiway 'C'.

 For noise abatement purposes, engine maintenance run-up pads with noise control barriers are recommended to be located both on the

south airfield and north airfield.

3.4.2 Landside Lease Area Requirements

The fully leased land areas along Wilmer Avenue and Airport Road may

require that other available vacant parcels of land on Lunken Airport be

developed in order to accommodate the projected design year Airport user

facility requirements. Major aviation-related functional areas require the

following three additional lease areas:

• CORPORATE: Three additional 4.0-acre lease areas (12 acres)

• FBOs: Two additional 5-6-acre lease areas (11 acres)

• SASOs: Three additional 4.0-acre lease areas (12 acres)

Chapter 4.0 Airfield and Landside Alternatives Analysis addresses the

options available to meet the airfield and landside facility requirements

outlined in this chapter.